

ABSTRACT

The development of wireless communication technology encourages the emergence of efficient alternative solutions, one of which is Free Space Optic (FSO) technology that utilizes light media as a wireless data transmission path. Compared to conventional wired systems, FSO has advantages in terms on installation flexibility, low cost, and free from electromagnetic interference. However, the system is highly dependent on environmental conditions and success in maintaining signal detection accuracy, so it often faces obstacles at certain distances and changes in light intensity. The main problem raised in this research is to be a replacement solution for wireless communication that is prone to physical interference, periodic repairs, or infrastructure limitations, so a wireless system is needed as a reliable alternative communication option, in addition to the limited performance of the FSO system in unstable environmental conditions such as rain or excessive light.

The solution offered in this final project is to design and implement a simple FSO communication system using a Continuous Wave laser and a microcontroller-based Light Dependent Resistor (LDR) sensor. The system is designed to perform point-to-point data transmission with a simple binary modulation method, and is equipped with serial data processing to evaluate system performance over various distances and environmental conditions. Tests were conducted at different times of day (morning, afternoon, and evening) and varying weather (rain and heat) to measure the reliability of the system.

The test results show that the system is able to work optimally at night with an average transfer rate of 83,85 bps and a data success rate of 91,55%, while performance decreases during the day and hot conditions with an average speed of 54,54 bps and a success rate of 81,25%. The maximum effective distance achieved was 13 meters in low light conditions. Based on these results, the developed FSO system shows good potential as an alternative short-range communication solution, especially in environments with controlled light intensity.

Keywords: FSO, Optical communication, LDR, Microcontroller, Data transmission